The impact of R&D organizations of the innovation development on the region's territory

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Abstract— **At present an innovative component transforming the economic operators' value chain in whole appears to be a constitutive element of the national economic systems development to effectively position them in the world market. Penetration of informational and innovation technologies into the chain of values is accompanied by the growth of intellectual capital share in overall cost structure. National economic systems development within the frames of a cluster facilitates adding value to invested intellectual capital and creating innovation products and services.**

Key words: innovation cluster, new materials, R&D institutions, enterprises.

In the terms of globalization there are different positions according the intellectual capital and innovation process in the territory of the regions. Reference [2] has given the definition of intellectual capital. Intellectual capital (IC) is commonly defined as the sum of an organization's resources encompassing collective The level of success is consisting of aptitude, attitude and available resources. The aptitude is the intellectual capital build of capabilities and capacity of an individual to complete the task of hand. Reference [5] described that the national intellectual capital development goes together with the economic development and should be regarded as an enhancer of national sustainable growth. Human capital and renewal capital will be the key intangible assets that decide the forerunners for sustainable national development among emerging countries. At the same time reference [15] pointed that the value drivers of the firm became increasingly intangible with less of the market capitalization explained by the mainly tangible assets recognized in financial statements. The adjusted book value of equity is the sum of book value of equity and value of the research asset (R&D). [1] According to the reference [10] innovation is the critical component of long-term economic prosperity, driving productivity growth and ensuring broad-based economic growth. Innovation cannot be dictated, but it can be cultivated. And reference [3] confirmed that the chances of a region to compete against other have to be evaluated. It might be sufficient to manage innovations in a particular field with a regional oligopolistic market structure. Some references [12] concluded that innovative sales are associated with revenue productivity, and that the association is stronger for higher technology sectors. The real revenue effect is the impact of innovation on both quantity and price. Technological innovation is lionized in most advanced societies; that is natural and desirable reflection of the values of a technologically progressive society. [1] Reference [4] has examined the definition of profit due to the innovation products. And in Schumpeter's theory, the profits made from innovations are then the decisive impulse for new surges of growth, acting as signed to swarms of imitators. Other reference [9] has explained the process of profit growth. The growth of profits (operating surplus, in real terms) is explained by the relevance of lagged innovative sales (a measure of Schumpeterian profits), and by the growth of demand (a measure of market expansion, proxied by the change in industry value added). According to Schumpeter's theory the innovation is defined as "doing things differently" in the realm of economic life. [16] Professor Schumpeter argued that innovations are not at any time distributed randomly over the whole economic system, but bend to be concentrated in certain key sectors and their surroundings, and that consequently they are by nature lopsided and disharmonious. [4]The model of this economic growth consists of the following statements: it is about growth generated by innovations, innovations result from entrepreneurial investments that are themselves motivated by the prospects of monopoly rents, new innovations replace old technologies, in other words, growth involves creative destruction. [18] At the same time the Schumpeter's models of the economy and of society are basically static. Innovation is exogenous to his model. [10]

The key features of innovation are:

- commercial characteristics;
- total degrees of new products and services;
- whatever characteristics;
- the group of participants worked through network.

The innovation development on the region is based on cluster's development. Clusters can be characterized as being economic networks of strongly independent firms, knowledge producing agents (universities, research institutes), bridging institutions and customers, linked to each other in a value-adding production chain. The cluster approach focuses on the linkages and interdependence between actors in the network of production when producing products and services and creating innovations. [14] Key objectives of cluster

managements in that life cycle include networking and matching as well as the provision of tailor-made services to the cluster participants to promote innovations. There are 3 stages of life cycle of cluster with different characteristics in such points, as importance of supporting, importance of cluster management excellence and importance of internationalization [13]:

- embryonic clusters;

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- national champions;
- world class clusters.

Some references [6] defined clusters like as:

- cohesive clusters (the groups of firms which initially located together to reduce costs. Their method of dealing with the threats posed by innovation were too bee extremely flexible in terms of rapidly responding to change in the production of new product and they drew on the abilities of a highly-skilled local labour force);
- new industrial districts (they often have a high-tech proportion of companies sectors such as computing, information technologies and micro-electronics);
- innovative milieux (this clusters actively seek to promote innovation rather than simply rapidly responding to it and actively work together common, medium and long-term innovative goals).
- Reference [8] has pointed the following cluster support environments model parts:
- support infrastructure (business technology centers);
- ideas (universities, entrepreneurs, companies);
- collaboration between companies (incubator, science park, business park, managed workspace);
- growth markets.
- A national system of innovation process can be defined as follows:
- the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies:
- the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning in a country. [18]

There are the following group of innovative clusters on the territory of the Russian Federation, as you can see from tables 1-6:

1. Clusters of information technologies and electronics;

2. Clusters of new (innovation technologies) materials;

3. Shipbuilding clusters;

4. Clusters of medical product and equipment;

5. Clusters of chemistry and oil-chemistry;

6. Clusters of radiation technologies.

TABLE I CLUSTERS OF INFORMATION TECHNOLOGIES AND ELECTRONICS ON TERRITORY OF THE RUSSIAN FEDERATION.

The name of the cluster	Type of products produced on the territory of the cluster
Cluster of information technologies (Zelenograd city)	IT-system
Cluster of information and biopharmaceutical technologies (Novosibirsk city)	Automation of technological processes
Cluster of the development of information technologies and radio electronics (Sankt-Peterburg city)	Equipment engineering

(Source: author's work)

TABLE II CLUSTERS OF NEW (INNOVATION TECHNOLOGIES) MATERIALS.

The name of the cluster	Type of products produced on the territory of the cluster
Cluster of new materials Chimky city)	The technology of telecommunication
Cluster of intellectual control systems of lighting The Republic of Mordovy)	Power effective light sources
Cluster of new materials (Sverdlovsk city)	The research and production of titan materials

(Source: author's work)

TABLE III SHIPBUILDING CLUSTERS.

The name of the cluster	Type of products produced on the territory of the cluster
The innovation territorial space cluster (Samara city)	Production flying and spacecrafts
Ship-building innovation territorial cluster (Archangelsk region)	Production flying and spacecrafts
The scientific and educational cluster (Uliynovsk city)	Production flying and spacecrafts

(Source: author's work)

TABLE IV CLUSTERS OF MEDICAL PRODUCT AND EQUIPMENT.

The name of the cluster	Type of products produced on the territory of the cluster
Cluster of pharmaceutics (Obninsk city)	Research, development and put into operation of pharmaceutics product
Biotechnological innovation territorial cluster (Pushino city)	Medical diagnostic units, food biotechnology.
Cluster of pharmaceutics and information technologies (Tomsk city)	Medical equipment, nano-materials, information technologies
Cluster of pharmaceutics (Altay region)	Biotechnological synthesis
Cluster of pharmaceutics (Sankt-Peterburg city)	Medical equipment to diagnostics

(Source: author's work)

TABLE V CLUSTERS OF CHEMISTRY AND OIL-CHEMISTRY.

The name of the cluster	Type of products produced on the territory of the cluster
The innovation territorial chemical cluster (Nignekamsk city, The Republic of Tatarstan)	Soprene rubber, propyl carbinol, halobutyl rubber, butadiene rubber, styrene, polystyrene resin, nanylphenol, ethylene glycol

Petrochemical innovation territorial cluster (The Republic of Bashkortostan)	Production of polymers organic synthesis of polyvinylchloride, caustic soda.
Petrochemical innovation territorial cluster (Nigny Novgorod city)	The production of polyvinylchloride
The cluster of complex to processing of coal and technogenic waste (Kemerevo city)	Coal chemistry, carbon materials

(Source: author's work)

TABLE VI CLUSTERS OF RADIATION TECHNOLOGIES.

The name of the cluster	Type of products produced on the territory of the cluster
Cluster of radiation equipment and technologies (Geleznogorsk city)	The development of chain production based on the polycrystalline silica
Innovative territorial cluster of nanotechnologies in the sphere of radiation technologies (Dubna city)	Technical security systems
The cluster of nuclear production (Dmitrov city)	Radiation technologies
The cluster of laser technologies (Troizk city)	Radiation technologies
Innovation territorial cluster (Sarovsky city)	Instrument engineering

(Source: author's work)

Today there are more than twenty innovation clusters on the territory of the regions of the Russian Federation in the area of information technologies and electronics, new (innovation technologies) materials, shipbuilding, medical product and equipment, chemistry and oil-chemistry; radiation technologies.

We designate analytical form of relation where the alteration of the effective index (the share of innovation product sales proceeds in the total volume of revenue) is stipulated by the influence of the factor (the share of the innovation produce expenditures in the overall volume of expenses).

The purpose of the given regression analysis is to evaluate functional relationship of the effective index conditional average Y (the share of innovation product sales proceeds in the total volume of revenue) and the factorial index X (the share of the innovation produce expenditures in the overall volume of expenses).

The conditional mathematical expectation of stochastical variable Y relative X in the given mathematical model is the following function:

$$M(Y/x) = f(x), \quad (1)$$

Regression of X on Y will be identified as:

$$M(X/y) = \varphi(y) \quad (2)$$

The assessed value of these functions are the following empirical equations of linear regression or conditional mean equations.

The empirical equations of linear regression in our case are presented as:

$$\bar{y}_x = \rho x + \beta, \quad (3)$$

$$x_y = \rho_i y + \beta_i, \quad (4)$$

With the aim of determining the generalized set of parameters in equation (3) let us use two linear equations system obtainable on the grounds of ordinary least squares technique since it makes possible to form expressions for ρ and β.

$$(\sum x_i^2)\rho + (\sum x_i)\beta = \sum x_i y_i, \quad (5)$$

$$(\sum x_i)\rho + n\beta = \sum y_i \quad (6)$$

$$\rho = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{n\sum x_i^2 - (\sum x_i)^2}, \quad (7)$$

$$\beta = \frac{(\sum x_i^2)(\sum y_i) - (\sum x_i)(\sum x_i y_i)}{n\sum x_i^2 - (\sum x_i)^2} \quad (8)$$

The parameters of ρ_i and β_i are found in a similar fashion.

To determine the relationships between the values under consideration let us introduce the concept of the sample empirical correlation moment and find out sample correlation coefficient.

TABLE VII DATA OF THE SHARE OF THE INNOVATION PRODUCE EXPENDITURES IN THE OVERALL VOLUME OF EXPENSES AND THE SHARE OF INNOVATION PRODUCT SALES PROCEEDS IN THE TOTAL VOLUME OF REVENUE ON CENTRAL AND VOLGA-REGION FEDERAL DISTRICTS, 2014.

x	y	x^2	y^2	$(x - x_y)^2$	$(y - \bar{y})^2$
0.003	0.04	0.000009	0.0016	0.000499	0.001898
0.022	0.102	0.000484	0.000104	1.12	0.00538
0.015	0.106	0.000225	0.011236	0.000107	0.0005
0.023	0.056	0.000529	0.003136	5.49	0.00076
0.009	0.006	0.000081	0.000036	0.000267	0.00602
0.016	0.045	0.000256	0.002025	8.73	0.00149
0.007	0.031	0.000049	0.000961	0.000336	0.00276
0.014	0.032	0.000196	0.001024	0.000129	0.00266
0.03	0.109	0.0009	0.011881	2.17	0.00065
0.03	0.105	0.0009	0.011025	2.17	0.00046
0.005	0.001	0.000025	0.000121	0.000414	0.00527
0.033	0.028	0.001089	0.000784	5.86	0.00309
0.009	0.019	0.000081	0.000361	0.000267	0.00417
0.035	0.044	0.001225	0.001936	9.32	0.00157
0.018	0.077	0.000324	0.005929	5.39	4.315
0.025	0.147	0.000625	0.021609	1.18	0.00402
0.066	0.151	0.004356	0.022801	0.001653	0.00455
0.047	0.133	0.002209	0.017689	0.000469	0.00244
0.012	0.06	0.000144	0.0036	0.000178	0.00602
0.012	0.01	0.000144	0.0001	0.000178	0.00682
0.03	0.229	0.0009	0.052441	2.17	0.0212
0.026	0.184	0.000676	0.033856	4.31	0.01
0.013	0.064	0.000144	0.004096	0.000178	0.00038
0.04	0.226	0.0016	0.051076	0.000215	0.0203
0.021	0.077	0.000441	0.005929	1.89	4.315
0.022	0.072	0.000484	0.005184	1.12	0.0001
0.066	0.17	0.004356	0.0289	0.001653	0.00747
0.009	0.016	0.000081	0.000256	0.000267	0.0046
0.038	0.115	0.001444	0.013225	0.00016	0.00099

0.075	0.245	0.005625	0.060025	0.002466	0.02606
0.029	0.034	0.000841	0.001156	1.34	0.00246
0.012	0.085	0.0000144	0.007225	0.000178	2.0485
		∑=0.031	∑=0.381		

(Source: author's work).

x- the share of the innovation produce expenditures in the overall volume of expenses;

y - the share of innovation product sales proceeds in the total volume of revenue).

Picture 1. The relationship between the share of the innovation produce expenditures in the overall volume of expenses (x) and the share of innovation product sales proceeds in the total volume of revenue (y) on Central and Volga-region Federal Districts, 2014.

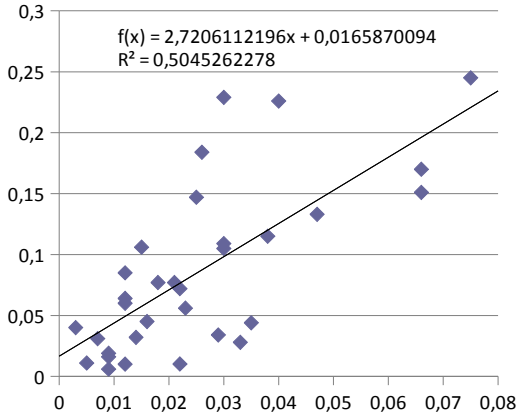
$$y(x) = 2{,}721x + 0{,}017 \quad (9)$$

$$R^2 = 0{,}505 \quad (10)$$

In compliance with the theories of economics innovative development the large share of capitalized expenses of the production unit guarantees in future high rates of profit performance due to the disposal of commodities, works and services at the enterprises – cluster participants.

The given study is of immediate interest for the markets emerging in the context of economic agents' global economic cooperation and strengthening the ties between them. As it is well-known, the innovative projects are marked by high investments and risks. Therefore, on the background of limited resources inherent to economic entities conducting business on macro level, the feasibility of investments either corporate or governmental in the total volume of revenue are presented in the form of linear regression dependence where:

- variable Y on the diagram presents the percentage of innovative products, works and services in the total volume of goods forwarded as well as executed works and services in shares whereas X is the share of expenditures for technological innovations in the total volume of forwarded goods as well as executed works and services in shares;
- the skewness of the regression model makes 2, 72 what means that the enlargement of the share of expenditures for technological innovations in the total volume of forwarded goods by 1%, brings to the increase of the share of expenditures for technological innovations in the total volume of goods forwarded as well as executed works and services in size of 2, 72;
- the skewness of the regression model making more than 1means that the given indexes are extremely changeable;
- the intercept of the regression model makes +0,017 what shows that for the periods when the share of expenditures for technological innovations in the total volume of forwarded goods, works and services was kept constant, the share of innovative products, works and services in the total volume of forwarded goods, works and services was increased by only 1,66%. This stipulates the efficiency of investments into the production and sales of innovative products, works and services;
- index R of the regression line shows that 50,5% alterability of the share of innovative products, works and services in the total volume of forwarded goods, works and services is determined by the variability of the share of innovative products, works and services in the total volume of forwarded goods, works and services.



Framing and development of territorial-production clusters within the territory of the Russian Federation appears to be one of the main factors in improving RF economics competitiveness according to The Concept Of Long-Term RF Socioeconomic Development For The Period Until 2020. Within the confines of the given Concept development of the innovational infrastructure is understood as "drastic improvement of the existing innovational infrastructure effectiveness including special economic zones, technology transfer centers, business incubators and technology parks" (The Concept Of Long-Term RF Socioeconomic Development For The Period Until 2020 №1662-p. 17.11.08.) The basic indicators of the Concept goals achievement can be considered as follows:

- market share of enterprises implementing technological innovations will amount to 40-50 % in 2020;
- the share of innovation sector in gross domestic product will reach 25-35%.
- In compliance with the Strategy of the RF Innovation Development serious faults of the market economy are manifested in:
- low level of innovation activity;
- low profitability of technological innovations as compared with the growth of absolute measures of innovational produce scope;
- advance in innovation sector financing from all levels of the RF budgeting system is not accompanied by the appropriate growth in innovation activity of enterprises;

- reduction in volume of private investments into scientific research and experimental development (NIOKR);
- scope of the RF innovation sector finance is low as compared to foreign partners;

According to the given Strategy "sustainable development of the federal and local innovational system components will be implemented either through the enhancement of utilization efficiency of functioning institutions - technology development special economic zones and technology parks or by means of innovation clusters stronger support…"

Critical success factors in framing and realization of innovation projects within the bounds of clusters are as follows:

- research institutes employing skilled persons to make technical-and-economic assessment and perform a project expert examination;
- accumulation of potential innovation product consumers throughout the entire territory of a cluster;
- niche specialization of business incubators and technology parks ensures high quality of an innovation product;
- permanent improvement of quality management system and corporate management at enterprises and organizations within the frames of a cluster.

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